

WHAT IS CLAIMED IS:

1. A printed circuit board constituted by alternately laminating interlayer resin insulating layers and conductive circuits on a core substrate containing a capacitor,

5 characterized in that

the core substrate containing said capacitor is constituted by providing a first resin substrate, a second resin substrate having an opening for containing the capacitor and a third resin substrate in a multilayer manner while interposing bonding plates.

10 2. A printed circuit board according to claim 1, wherein each of said bonding plates has a core impregnated with a thermosetting resin.

15 3. A printed circuit board according to claim 1 or 2, wherein each of said first, second and third resin substrates has a core impregnated with a resin.

20 4. A printed circuit board according to any one of claims 1 to 3, wherein a plurality of said capacitors are provided.

25 5. A printed circuit board according to any one of claims 1 to 4, wherein

the conductor circuits are formed on said second resin substrate.

30 6. A printed circuit board according to any one of claims 1 to 5, wherein

the capacitor is mounted on a surface of said printed circuit board.

7. A printed circuit board according to claim 6, wherein
a capacitance of the chip capacitor on said surface is
equal to or higher than a capacitance of a chip capacitor on
5 an inner layer.
8. A printed circuit board according to claim 6, wherein
an inductance of the chip capacitor on said surface is
equal to or higher than an inductance of the chip capacitor on
10 an inner layer.
9. A printed circuit board according to any one of claims
1 to 8, wherein
15 a metal film is formed on an electrode of said capacitor.
10. A printed circuit board according to claim 9, wherein
the metal film formed on the electrode of said capacitor
is a plated film mainly consisting of copper.
- 20 11. A printed circuit board according to claims 1 to 8, wherein
at least a part of a coating layer of the electrode of
said capacitor is exposed and electrically connected to the
electrode exposed from said coating layer.
- 25 12. A printed circuit board according to any one of claims
1 to 11, wherein
a chip capacitor having electrodes formed inside of an
outer edge is employed as said capacitor.
- 30 13. A printed circuit board according to any one of claims
1 to 12, wherein
a chip capacitor having electrodes formed in a matrix is

employed as said capacitor.

14. A printed circuit board according to any one of claims
1 to 13, wherein

5 a plurality of chip capacitors for providing many
capacitors are coupled to be employed as said capacitor.

15. A printed circuit board according to claim 1, wherein
said first resin substrate and said capacitor are coupled
10 to each other by an insulating bonding agent and the insulating
bonding agent is lower in a coefficient of thermal expansion
than said first resin substrate.

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16. A printed circuit board manufacturing method
15 characterized by comprising at least the following steps (a)
to (d):

(a) forming a conductor pad section on a first resin substrate;
(b) connecting a capacitor to said conductor pad section of
said first resin substrate through a conductive bonding agent,
20 (c) providing a third resin substrate, a second resin substrate
having an opening for containing said capacitor and said first
resin substrate in a multilayer manner while interposing bonding
plates so that said capacitor of said first resin substrate is
contained in said opening of said second resin substrate and
25 that said opening of said second resin substrate is closed by
the third resin substrate; and
(d) heating and pressurizing said first resin substrate, said
second resin substrate and said third resin substrate, to thereby
provide a core substrate.

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17. A printed circuit board constituted by providing resin
insulating layers and conductor circuits on a core substrate

in a multilayer manner, characterized in that
said core substrate is constituted by bonding together
a plurality of resin substrates, the conductor circuits formed
on said plurality of resin substrates; and
5 a capacitor is contained in said core substrate.

18. A printed circuit board constituted by providing resin insulating layers and conductor circuit on a core substrate in a multilayer manner, characterized in that
10 said core substrate is constituted by bonding together a plurality of resin substrates, the conductor circuits formed on said plurality of resin substrates; and
15 a capacitor is contained in a concave portion formed in said core substrate.
19. A printed circuit board according to claim 17 or 18, wherein
said plurality of resin substrates are bonded together by
interposing bonding plates.
20. 20. A printed circuit board according to claim 19, wherein
each of said bonding plate has a core impregnated with
a thermosetting resin.
21. A printed circuit board according to any one of claims
25 17 to 20, wherein
each of said resin substrates has a core impregnated with
a resin.
22. A printed circuit board according to any one of claims
30 17 to 21, wherein
a plurality of said capacitors are provided.

23. A printed circuit board according to any one of claims 17 to 21, wherein

the capacitor is mounted on a surface of said printed circuit board.

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24. A printed circuit board according to claim 23, wherein a capacitance of a chip capacitor on said surface is equal to or higher than a capacitance of a chip capacitor on an inner layer.

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25. A printed circuit board according to claim 23, wherein an inductance of a chip capacitor on said surface is equal to or higher than an inductance of the chip capacitor on an inner layer.

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26. A printed circuit board according to any one of claims 17 to 25, wherein a metal film is formed on an electrode of said capacitor and is electrically connected to the electrode on which said metal film is formed, by plating.

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27. A printed circuit board according to claim 26, wherein the metal film formed on the electrode of said capacitor is a plated film mainly consisting of copper.

25 28. A printed circuit board according to claims 17 to 27, wherein

at least a part of a coating layer of the electrode of said capacitor is exposed and electrically connected to the electrode exposed from said coating layer.

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29. A printed circuit board according to any one of claims 17 to 28, wherein

a chip capacitor having electrodes formed inside of an outer edge is employed as said capacitor.

30. A printed circuit board according to any one of claims
5 17 to 29, wherein

a chip capacitor having electrodes formed in a matrix is employed as said capacitor.

31. A printed circuit board according to any one of claims
10 17 to 30, wherein

a plurality of chip capacitors for providing many capacitors are coupled to be employed as said capacitor.

32. A printed circuit board according to claim 17 or 18, wherein
15 the capacitor is coupled to said core substrate by an insulating bonding agent and the insulating bonding agent is lower in a coefficient of thermal expansion than said core substrate.

20 33. A printed circuit board manufacturing method characterized by comprising at least the following steps (a) to (e):

(a) forming conductor circuits on a plurality of resin substrates;

25 (b) providing a plurality of said resin substrates in a multilayer manner through bonding plates;

(c) bonding together said resin substrates through said bonding plates, to thereby provide a core substrate;

(d) forming a concave portion in said core substrate; and

30 (e) containing a capacitor in said concave portion.

34. A printed circuit board manufacturing method comprising

at least the following steps (a) to (e):

- (a) forming a resin substrate with a through hole and having a conductor circuit provided on a surface;
- 5 (b) forming a resin substrate without a through hole and having a conductor circuit provided on a surface;
- (c) providing said resin substrate with the through hole and said resin substrate without the through hole through a bonding plate in a multilayer manner;
- 10 (d) bonding together said resin substrates through said bonding plate, to thereby provide a core substrate; and
- (e) containing a capacitor in said concave portion.

35. A printed circuit board constituted by alternately providing interlayer resin insulating layers and conductor circuits in a multilayer manner on a core substrate containing a capacitor, characterized in that

the core substrate containing said capacitor is constituted by providing a first resin substrate, a second resin substrate having an opening for containing the capacitor and a third resin substrate in a multilayer manner while interposing bonding plates; and

via holes connected to a terminal of said capacitor are provided on both sides of said core substrate.

25 36. A printed circuit board according to claim 35, wherein each of said bonding plates has a core impregnated with a thermosetting resin.

30 37. A printed circuit board according to claim 35 or 36, wherein each of said first, second and third resin substrates has a core impregnated with a resin.

38. A printed circuit board according to any one of claims
35 to 37, wherein
a plurality of said capacitors are provided.

5 39. A printed circuit board according to any one of claims
35 to 38, wherein
the conductor circuits are formed on said second resin
substrate.

10 40. A printed circuit board according to any one of claims
35 to 39, wherein
the capacitor is mounted on a surface of said printed
circuit board.

15 41. A printed circuit board according to claim 40, wherein
a capacitance of a chip capacitor on said surface is equal
to or higher than a capacitance of a chip capacitor on an inner
layer.

20 42. A printed circuit board according to claim 40, wherein
an inductance of a chip capacitor on said surface is equal
to or higher than an inductance of the chip capacitor on an inner
layer.

25 43. A printed circuit board according to any one of claims
35 to 42, wherein
wherein a metal film is formed on an electrode of said
capacitor and is electrically connected to the electrode on which
said metal film is formed, by plating.

30 44. A printed circuit board according to claim 43, wherein
the metal film formed on the electrode of said capacitor

is a plated film mainly consisting of copper.

45. A printed circuit board according to claims 35 to 42,
wherein

5 at least a part of a coating layer of the electrode of
said capacitor is exposed and electrically connected to the
electrode exposed from said coating layer.

46. A printed circuit board according to any one of claims
10 35 to 45, wherein

a chip capacitor having electrodes formed inside of an
outer edge is employed as said capacitor.

47. A printed circuit board according to any one of claims
15 35 to 46, wherein

a chip capacitor having electrodes formed in a matrix is
employed as said capacitor.

48. A printed circuit board according to any one of claims
20 35 to 47, wherein

a plurality of chip capacitors for providing many
capacitors are coupled to be employed as said capacitor.

49. A printed circuit board according to claim 35, wherein
25 said first resin substrate and said capacitor are coupled
to each other by an insulating bonding agent and the insulating
bonding agent is lower in a coefficient of thermal expansion
than said first resin substrate.

30 50. A printed circuit board manufacturing method
characterized by comprising at least the following steps (a)
to (d):

- (a) attaching a capacitor to a first resin substrate through a bonding material;
 - (b) providing a third resin substrate, a second resin substrate having an opening for containing said capacitor and a first resin substrate in a multilayer manner so that said capacitor of said first resin substrate is contained in said opening of said second resin substrate and that said opening of said second resin substrate is closed by said third resin substrate, thereby providing a core substrate;
 - (c) applying laser and forming a via hole opening reaching said capacitor in said core substrate;
 - (d) forming a via hole in said via hole opening.
51. A printed circuit board manufacturing method characterized by comprising at least the following steps (a) to (f):
- (a) forming a via hole formation opening in a metal film on one side of a first resin substrate;
 - (b) attaching a capacitor to a metal film unformed surface of said first resin substrate through a bonding material;
 - (c) providing a third resin substrate, a second resin substrate having an opening for containing said capacitor and said first resin substrate in a multilayer manner by interposing bonding plates so that said capacitor of said first resin substrate is contained in said opening of said second resin substrate and that said opening of said second resin substrate is closed by said third resin substrate;
 - (d) heating and pressurizing said first resin substrate, said second resin substrate and said third resin substrate, to thereby provide a core substrate;
 - (e) applying laser to said via hole formation opening formed in said metal film of said first resin substrate, and forming

a via hole opening reaching said capacitor; and
(f) forming a via hole in said via hole opening.

52. A printed circuit board manufacturing method
5 characterized by comprising at least the following steps (a)
to (f):

- (a) forming via hole formation openings in metal films of a first resin substrate and a third resin substrate, the metal films bonded on one sides of said first resin substrate and said 10 third resin substrate, respectively;
- (b) attaching a capacitor to a metal film unformed surface of said first resin substrate through a bonding material;
- (c) providing said third resin substrate, a second resin substrate having an opening for containing said capacitor and said first resin substrate in a multilayer manner by providing a bonding plate on said metal film unformed surface so that said 15 capacitor of said first resin substrate is contained in said opening of said second resin substrate and that said opening of said second resin substrate is closed by said third resin substrate;
- (d) heating and pressurizing said first resin substrate, said second resin substrate and said third resin substrate, to thereby provide a core substrate;
- (e) applying laser to said via hole formation openings formed 25 in said first resin substrate and said third resin substrate, and forming a via hole opening reaching said capacitor; and
- (f) forming a via hole in said via hole opening.

53. A printed circuit board manufacturing method
30 characterized by comprising at least the following steps (a)
to (g):

- (a) forming a through hole formation openings in metal films

of a first resin substrate and a third resin substrate, the metal films bonded on one sides of said first resin substrate and said third resin substrate, respectively;

(b) attaching a capacitor to a metal film unformed surface

5 of said first resin substrate through a bonding material;

(c) providing said third resin substrate, a second resin substrate having an opening for containing said capacitor and said first resin substrate in a multilayer manner by providing a bonding plate on said metal film unformed surface so that said 10 capacitor of said first resin substrate is contained in said opening of said second resin substrate and that said opening of said second resin substrate is closed by said third resin substrate;

(d) heating and pressurizing said first resin substrate, said 15 second resin substrate and said third resin substrate, to thereby provide a core substrate;

(e) applying laser to said through hole formation openings formed in said first resin substrate and said third resin substrate, and forming a via hole opening reaching said 20 capacitor;

(f) removing or thinning said metal films; and

(g) forming a conductor circuit and a via hole on said core 25 substrate.

54. A printed circuit board constituted by providing resin insulating layers and conductor circuits on a core substrate in a multilayer manner, characterized in that

a capacitor is included in said core substrate, and a relatively large lower-layer via hole connected to an electrode 30 of said capacitor is formed; and

a plurality of relatively small upper-layer via holes connected to one said lower-layer via hole are provided in an

interlayer resin insulating layer on an upper surface of said core substrate.

55. A printed circuit board according to claim 54, wherein
5 said lower-layer via hole is a filled via hole filled with
an plated material and having a flat surface.

56. A printed circuit board according to claim 54, wherein
10 said lower-layer via hole is a filled via hole having a
resin filled inside and a metal film formed on a surface

57. A printed circuit board according to claim 54, wherein
15 said capacitor is singularly contained in a concave portion
formed in said core substrate.

58. A printed circuit board according to claim 54, wherein
20 a plurality of said capacitors are contained in a concave
portion formed in said core substrate.

59. A printed circuit board according to claim 54, wherein
25 a metal film is formed on an electrode of said capacitor
and electrically connected to the electrode on which said metal
film is formed, by plating.

60. A printed circuit board according to claim 59, wherein
25 the metal film formed on the electrode of said chip
capacitor is a plated film mainly consisting of copper.

61. A printed circuit board according to claims 54 to 58,
30 wherein
 at least a part of a coating layer of the electrode of
said capacitor is exposed and electrically connected to the

electrode exposed from said coating layer.

62. A printed circuit board according to any one of claims
54 to 61, wherein

5 a chip capacitor having electrodes formed inside of an
outer edge is employed as said capacitor.

63. A printed circuit board according to any one of claims
54 to 62, wherein

10 a chip capacitor having electrodes formed in a matrix is
employed as said capacitor.

64. A printed circuit board according to any one of claims
54 to 63, wherein

15 a plurality of chip capacitors for providing many
capacitors are coupled to be employed as said capacitor.

65. A printed circuit board according to claim 54, wherein
a resin lower, in a coefficient of thermal expansion, than
20 the core substrate is filled between said core substrate and
the capacitor.

66. A printed circuit board manufacturing method
characterized by comprising at least the following steps (a)
25 to (e):

- (a) embedding a capacitor in a core substrate;
- (b) forming a resin insulating layer on an upper surface of
said capacitor;
- (c) forming a relatively large lower-layer via hole connected
30 to an electrode of said capacitor, in said resin insulating layer;
- (d) forming an interlayer resin insulating layer on an upper
surface of said core substrate; and

- (e) providing a plurality of relatively small upper-layer via holes connected to one said lower-layer via hole, in said interlayer resin insulating layer.
- 5 67. A printed circuit board manufacturing method according to claim 66, comprising, before the step (a), a step of forming a concave portion in said core substrate and containing said capacitor in said concave portion.
- 10 68. A printed circuit board manufacturing method according to claim 66, comprising, before the step (a), a step of forming a concave portion in said core substrate and containing a plurality of said capacitors in said concave portion.
- 15 69. A printed circuit board manufacturing method according to claim 66, comprising, before the step (a), a step of forming a through hole in a resin plate, and bonding a resin plate to said resin plate on which said through hole is formed, to thereby form a core substrate having a concave portion.
- 20 70. A printed circuit board manufacturing method according to claim 66, wherein a filled via hole filled with a plated material and having a flat surface is formed when forming said lower-layer via hole.
- 25 71. A printed circuit board manufacturing method according to claim 66, wherein a filled via hole formed by filling a resin inside and then providing a metal film on a surface, is formed when forming said lower-layer via hole.
- 30 72. A printed circuit board manufacturing method according to claim 68, comprising, after the step (a), a step of applying

a pressure to upper surfaces of said plurality of capacitors within said concave portion from above, and making heights of the upper surfaces of said capacitors uniform.